CLAIMS

1. A method of addressing a bistable nematic device formed by two cell walls (3, 4) enclosing a layer (2) of nematic or long pitch cholesteric liquid crystal material with electrode structures carried by the walls to form a series of row electrodes (6) on on wall (4) and a series of column electrodes (7) on the other wall (3) to form a matrix of intersecting regions or pixels with a wall surface treatment on at least one wall providing a molecular alignment permitting the molecules at or adjacent the wall to align into two different stable states upon application of appropriate unipolar voltage pulses, the method comprising the steps of:-

applying a row waveform to each row in a sequence whilst simultaneously applying one of two data waveforms to each column electrode whereby each pixel can be independently switched between two bistable states;

the row waveform having a period of at least two time slots and at least two unipolar pulses for switching the device to a first state, at least two unipolar pulses for switching the device to a second state;

both data waveforms having a period of at least two time slots with a unipolar pulse in each time slot, with at least one data waveform shaped to combine with the row waveform to cause a switching to one latched state;

whereby each pixel can be addressed to latch into either stable state to collectively provide a desired display, with a substantially net zero dc voltage applied to the device.

2. The method of claim 1 wherein the addressing of the device is in two field times, one for switching to one stable state, and the other for switching into the second stable state.

3. The method of claim 2 wherein the field times are of the same length.

4. The method of claim 2 wherein the field times are different in length.

5. The method of claim 1 wherein the device is addressed by selectively switching pixels to one state in one field time and selectively switching pixels to the other state in the second field time.

6. The method of claim 1 wherein the two unipolar pulses switching the device to a first state are blanking pulses and the unipolar pulses for switching the device to a second state are switching pulses, and wherein some or all of the pixels are blanked into one state, then selectively switched to the other state.

7. The method of claim 1 wherein the row waveform has at least one unipolar pulse of an amplitude capable of blanking pixels, and at least one unipolar addressing pulse of an amplitude capable of combining with data waveforms to selectively switch pixels.

8. The method of claim 6 wherein the blanking pulses are of equal and opposite amplitude and the switching pulses are of equal and opposite amplitude.

9. The method of claim 6 wherein the blanking pulses are of unequal, including on zero amplitude value, but opposite amplitude and the switching pulses are of unequal, including one zero amplitude value, and opposite amplitude arrange so that overall the device receives substantially net zero dc voltage when addressed.

10. The method of claim 6 wherein the blanking pulses are of the same or different amplitude to those of the switching pulses.

11. The method of claim 6 wherein the blanking and the switching pulses are equally or unequally spaced apart in time.

12. The method of claim 1 wherein the row waveform has at least two unipolar blanking pulses for blanking pixels to one state and at least two unipolar switching pulses for selectively switching pixels to a second state, and each row is addressed in a sequence by the blanking pulses then by the switching pulses in combination with one of the two data waveforms.

13. The method of claim 12 wherein the blanking pulses and the switching pulses are separated by a period of at least one line address time.

14. The method of claim 12 wherein during the application of blanking pulses to on row, the columns receive no voltage pulses, the non addressed rows receive no voltage pulses, and pixels not being blanked receive zero voltage.

15. The method of claim 12 wherein the blanking pulses and the switching pulses are separated by a period of at least one line address time during which time the row waveform is of zero amplitude

16. The method of claim 1 wherein the row and data waveforms have the same periods of two, three, four, or more time slots ts.

17. The method of claim 1 wherein both the row waveform and the data waveforms are formed of three or more time periods and at least one time slot in the strobe waveforms and/or the data waveforms are of zero voltage amplitude.

18. The method of claim 1 wherein the addressing is by application of the row waveform to each row in turn.

19. The method of claim 1 wherein the addressing is by application of the row waveform to each row in an interleaved manner (Figure 11).

20. The method of claim 1 wherein additional voltage reduction waveforms are applied to either or both the row waveform and the two data waveforms.

21. The method of claim 1 and comprising the further step of arranging the surface treatment so that switching to one of the bistable states occurs at a lower voltage than switching to the other bistable state.

22. The method of claim 1 wherein the temperature of the liquid crystal material is measured and voltages adjusted to compensate for switching characteristics with temperature.

23. The method of claim 1 wherein the line addressing time is selected to minimise pixel pattern dependence.

24. The method of claim 1 wherein additional waveforms are applied to the row and or column electrodes to reduce rms voltage levels at the pixels and improve display contrast.

25. A bistable nematic device comprising;

two cell walls (3, 4) spaced apart and enclosing a layer (2) of nematic or long pitch cholesteric liquid crystal material;

a first series of electrodes (6) on one wall (4) and a second series of electrodes (7) on the other wall (3) collectively forming a matrix of intersecting regions or pixels;

surface treatments on at least one wall (3, 4) to provide a molecular alignment permitting the molecules at or adjacent the wall to align into two different stable states upon application of appropriate unipolar voltage pulses;

means (13, 13') for distinguishing between the switched states of the liquid crystal material;

means (8, 10) for generating and applying a row waveform to each electrode (6) in the first series of electrodes in a sequence;

means (9, 10) for generating and applying one of two data waveforms to each electrode (7) in the second series of electrodes;

the row waveform having a period of at least two time slots and at least two unipolar pulses for switching the device to a first state, at least two unipolar pulses for switching the device to a second state;

both data waveforms having a period of at least two time slots with a unipolar pulse in each time slot, with at least one data waveform shaped to combine with the strobe waveform to cause a switching to the first state and the other data waveform shaped to combine with the strobe waveform to cause a switching to the second state;

whereby each pix l can be independently switched into either stable state to collectively provide a desired display, with a substantially n t zero dc voltage appli d to the device.

26. The device of claim 25 wherein the energy levels of liquid crystal molecules at the wall surface alignment treatment in the two stable states are adjusted to be similar so that switching characteristics (Figure 5) are the same when switching between the two states.

27. The device of claim 25 wherein the energy levels of liquid crystal molecules at the wall surface alignment treatment in the two stable states are adjusted to be different so that switching characteristics (Figure 5) are different when switching between the two states.

28. The device of claim 25 wherein the height to width ratio of a grating wall surface treatment is arranged to give different switching characteristics when the device is switched into the two bistable states.

29. The device of claim 25 and further including means (10, 8, 9) for generating and applying to each electrode in either or both the first and second series of electrodes (6, 7) a voltage reduction waveform.